

## Missouri Department of Natural Resources

# Total Maximum Daily Load Information Sheet

## Stinson Creek

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### Water Body Segment at a Glance:

**County:** Callaway  
**Nearby Cities:** Fulton  
**Length of impairment:** 0.1 miles  
**Length of classified water body segment:** 9.0 miles  
**Pollutants:** Low Dissolved Oxygen (DO)  
Organic Sediment  
**Source:** Fulton Wastewater Treatment Plant (WWTP)  
**Water Body ID:** 0710



State map showing location of watershed

**TMDL Priority Ranking:** High

**Scheduled for TMDL Development:** 2008

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### Description of the Problem

#### Beneficial uses of Stinson Creek

- Livestock and Wildlife Watering
- Protection of Warm Water Aquatic Life
- Human Health Protection (Fish Consumption)
- Whole Body Contact Recreation

#### Use that is impaired

- Protection of Warm Water Aquatic Life

#### Standards that apply

- The Missouri Water Quality Standards (WQS) are found in 10 CSR 20-7.031. The chronic criterion for dissolved oxygen (DO) in streams, found in Table A of this section, is 5.0 mg/L (milligrams per liter, or parts per million). Dissolved oxygen criteria are related to load capacity of biochemical oxygen demand (BOD) in the TMDL.
- Standards for organic sediment may be found in the general criteria section of the WQS, 10 CSR 20-7.031(3) where it states:
  - Waters shall be free from substances in sufficient amounts to cause the formation of putrescent, unsightly or harmful bottom deposits or prevent full maintenance of beneficial uses.
  - Waters shall be free from substances in sufficient amounts to cause unsightly color or turbidity, offensive odor or prevent full maintenance of beneficial uses.

## **Background Information and Water Quality Data**

Stinson Creek was originally placed on the 303(d) list of impaired waters in 1994 for BOD and ammonia, with the City of Fulton's wastewater treatment plant (WWTP) identified as the source of the impairment. Additional data prompted the removal of ammonia from the 2002 303(d) list, but volatile suspended solids (VSS) were added based on visual observations of the stream's substrate.

For the 2004/2006 303(d) list, all listings for BOD were changed to low dissolved oxygen (DO), and VSS was changed to organic sediment. These changes were made in order to reconcile the oxygen impairment with the state's water quality standards and, in the case of sediment, to help make the list more understandable to the general public. The causes of the impairments and the data used to identify them have not changed. Most aquatic organisms require high levels of dissolved oxygen to survive, but wastewater high in BOD reduces the amount of DO in the stream's water. Organic sediment consists of non-mineral particles that are suspended in water and then settle out, potentially smothering the streambed and filling in important habitat for aquatic invertebrates and fish. Organic sediment can be contributed as sludge discharged directly in wastewater effluent, or can result from excessive algae growth associated with nutrient inputs into the stream.

The department had proposed removing Stinson Creek from the 2004/2006 303(d) list. Low-flow sampling results between 1999-2002 showed low DO levels both downstream and upstream of the WWTP, and the department determined that it could not confidently ascribe downstream conditions solely to the Fulton plant. An additional low-flow study was conducted in the upper Stinson Creek watershed, above Fulton, in August of 2007. This study concluded that much of the upper portion of the watershed was hydrologically disconnected from – and had little, if any, impact upon – the lower portion below the WWTP. The study also concluded that the wastewater treatment facilities in the upper portion of the watershed had no observable negative impact on water quality at the time of the study, and that low dissolved oxygen was primarily related to physical factors associated with low-flow conditions. In the approved 2004/2006 303(d) list issued in 2009, the U.S. Environmental Protection Agency (EPA) restored Stinson Creek to the list, noting that in addition to permitted wastewater dischargers, the surrounding watershed contains both urban and agricultural land. As a result, they concluded that the department's data could not support the argument that low DO in Stinson Creek is strictly the result of natural conditions uninfluenced by anthropogenic sources.

Water quality data around the Fulton WWTP were collected during low-flow periods between 1999-2002. EPA conducted additional water quality sampling in May and September of 2008 to obtain data to be used in setting point and nonpoint source allocations in the TMDL for Stinson Creek. The discharge permit for the Fulton plant is scheduled to be renewed in August 2010. By modifying the conditions of the permit based upon the waste load allocation identified in the TMDL, the quality of the plant's effluent discharge will be improved and result in improvements to the water quality of Stinson Creek.

These data are summarized in the table below, with the map of sample locations on the following page.

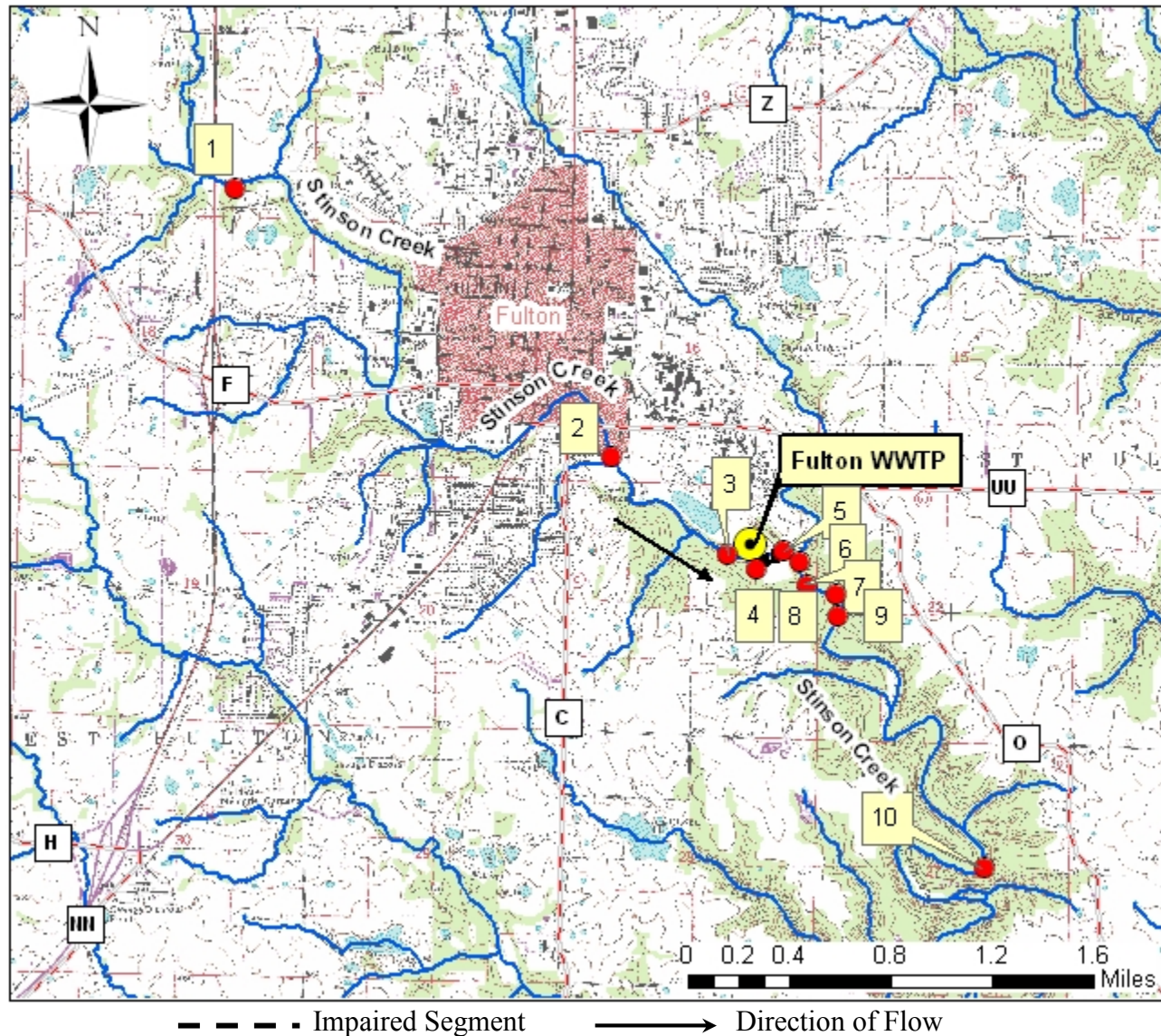
## Water Quality in Stinson Creek in the Vicinity of the Fulton WWTF, 1999-2002 and 2008

Organization	Site Name	Yr	Mo	Dy	Time	Flow	C	DO	pH	NH3N
MDNR	Stinson Cr. @ CR 217	2007	8	22	728		25	2.1	7.4	0.03
MDNR	Stinson Cr. nr Trailer Park	2007	8	22	745	0	25	1.8	7.3	1.1
MDNR	Stinson Cr. @ Hwy 54	2007	8	22	712	0	24.4	2	7.5	0.1
MDNR	Stinson Cr. @ Hwy O	2007	8	22	650		25.3	1.9	7.3	0.3
EPA	Stinson Cr. 3.3 mi. above Fulton WWTP	2008	5	20	1736		19.4	11	7.5	ND
EPA	Stinson Cr. 3.3 mi. above Fulton WWTP	2008	9	10	825		16.9	8.1	7.5	0.61
EPA	Stinson Cr. 0.74 mi. above Fulton WWTP	2008	5	20	1636		21.5	12.5	8.3	ND
EPA	Stinson Cr. 0.74 mi. above Fulton WWTP	2008	9	10	945		17.4	9	7.8	0.86
MDNR	Stinson Cr. 0.1 mi.ab. Fulton WWTP	1999	9	3		0	22	3.1		0.025
MDNR	Stinson Cr. 0.1 mi.ab. Fulton WWTP	1999	10				10	4.7		
MDNR	Stinson Cr. 0.1 mi.ab. Fulton WWTP	2002	8	8	1353		26	4	8.2	0.025
MDNR	Stinson Cr. 0.1 mi.ab. Fulton WWTP	2002	8	8	732	0.02	18	4	7.5	0.025
EPA	Fulton WWTP outfall 001	2008	5	20	1428		18.7	8	7.5	ND
EPA	Fulton WWTP outfall 001	2008	9	10	1020		21.1	7.7	7.8	0.63
MDNR	Fulton WWTP outfall 001	2001	8	16	1410	2.4	24	7.8	7.9	0.06
MDNR	Fulton WWTP outfall 001	2001	8	17	700	2.3	23	6.8	8.1	0.025
MDNR	Fulton WWTP outfall 001	2002	8	8	730	1.5	24	6.1	7.8	0.025
MDNR	Fulton WWTP outfall 001	2002	8	8	1346		25	7.1	8	0.025
EPA	Stinson Cr. 0.1 mi.bl. Fulton WWTP	2008	5	20	1452		20.8	14.7	8.3	ND
EPA	Stinson Cr. 0.1 mi.bl. Fulton WWTP	2008	9	10	1125		20	8.4	7.9	0.11
MDNR	Stinson Cr. 0.1 mi.bl. Fulton WWTP	1999	9	3		2	22	5.8		0.025
MDNR	Stinson Cr. 0.1 mi.bl. Fulton WWTP	1999	10				14	7.7		
MDNR	Stinson Cr. 0.1 mi.bl. Fulton WWTP	2002	8	8	722	1.5	22	4.3	7.9	0.025
MDNR	Stinson Cr. 0.1 mi.bl. Fulton WWTP	2002	8	8	1332		26	7.2	8.2	0.025
MDNR	Stinson Cr. 0.2 mi.bl. Fulton WWTP	2001	8	16	1405	0.3	24	10.3	8	0.025
MDNR	Stinson Cr. 0.2 mi.bl. Fulton WWTP	2001	8	17	705	0.3	20	4.8	7.8	0.05
MDNR	Stinson Cr. 0.2 mi.bl. Fulton WWTP	1999	10				14	7.7		
MDNR	Stinson Cr. 0.3 mi.bl. Fulton WWTP	1999	10				13	6.4		
MDNR	Stinson Cr. 0.4 mi.bl. Fulton WWTP	2001	8	16	1425	2.7	25	7.1	8	0.07
MDNR	Stinson Cr. 0.4 mi.bl. Fulton WWTP	2001	8	17	645	2.6	21	4.7	7.8	0.12
MDNR	Stinson Cr. 0.4 mi.bl. Fulton WWTP	1999	9	3			23	6		
MDNR	Stinson Cr. 0.4 mi.bl. Fulton WWTP	1999	10				13	8.1		
MDNR	Stinson Cr. 0.5 mi.bl. Fulton WWTP	1999	9	3				5.8		
MDNR	Stinson Cr. 0.5 mi.bl. Fulton WWTP	2002	8	8	657	1.5	20	3.9	7.9	0.025
MDNR	Stinson Cr. 0.5 mi.bl. Fulton WWTP	2002	8	8	1310		25	12.9	8.4	0.025
EPA	Stinson Cr. 0.6 mi. bl. Smith Branch	2008	5	20	1600		21.4	16.8	8.8	ND
EPA	Stinson Cr. 0.6 mi. bl. Smith Branch	2008	9	10	1100		18.8	9.5	8	0.60
MDNR	Stinson Cr. Below Smith Branch	2001	8	16	1340	3.3	25	12.8	8.4	0.025
MDNR	Stinson Cr. Below Smith Branch	2001	8	17	610	3.2	20	4.4	8.1	0.025
EPA	Stinson Cr. 2.2 mi.bl. Fulton WWTP	2008	5	20	1340		20.1	20	8.9	ND
EPA	Stinson Cr. 2.2 mi.bl. Fulton WWTP	2008	9	10	1200		18.1	9.8	8.2	0.05

*Note:* Highlighted DO data do not meet WQS during the critical period (morning hours), when DO is the lowest.

*Abbreviations:* ND= Non-Detect, C= water temperature (Celsius), DO= dissolved oxygen in milligrams per liter (mg/L), NH3N= ammonia as nitrogen (mg/L).

## Stinson Creek in Callaway County, Missouri, with Sampling Sites



### Sample Site Index for Stinson Creek

1 – 3.3 miles above Fulton WWTP	6 – 0.2 mile below WWTP
2 – 0.74 miles above Fulton WWTP	7 – 0.3 mile below WWTP
3 – 0.1 miles above Fulton WWTP	8 – 0.4 mile below WWTP
4 – Fulton WWTP Outfall (discharge)	9 – 0.5 mile below WWTP
5 – 0.1 mile below WWTP	10 – 2.2 mile below WWTP

### For more information call or write:

Missouri Department of Natural Resources, Water Protection Program  
P.O. Box 176, Jefferson City, MO 65102-0176  
1-800-361-4827 or (573) 751-1300 office, or (573) 522-9920 fax  
Program Home Page: [www.dnr.mo.gov/env/wpp/index.html](http://www.dnr.mo.gov/env/wpp/index.html)